

Los Alamos

NATIONAL LABORATORY

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

TA-03

Date: December 22, 1999
In Reply Refer To: ESH-18/WQ&H:99-0475
Mail Stop: K497
Telephone: (505) 667-7969

Ms. Julie Wanslow
Hazardous and Radioactive Materials Bureau
New Mexico Environment Department
P.O. Box 26110
Santa Fe, New Mexico 87502-6110

DEC 1999
RECEIVED

**SUBJECT: SURVEY OF PERCHLORATE-RELATED SITES AT LOS ALAMOS
NATIONAL LABORATORY**

Dear Ms. Wanslow:

In your September 29, 1999, letter (see Attachment I) to Los Alamos National Laboratory (Laboratory), you requested assistance in identifying perchlorate-related sites at the Laboratory. In addition, you requested that this information be provided to your agency in a two-part response with the first part due by October 31, 1999, and the second part due by December 31, 1999. In an October 26, 1999, letter the Laboratory informed you that pursuant to your October 22, 1999, telephone conversation with Bob Beers of my staff, the Laboratory would be combining the two-part response into a single response. Please consider this letter and the enclosed attachments as the Laboratory's response to your request.

As you are aware, perchlorate (ClO_4) is a new contaminant-of-concern that is currently not regulated by the New Mexico Water Quality Control Commission Regulations, the Safe Drinking Water Act, or the Laboratory's NPDES Permit. As a result, no perchlorate monitoring has been conducted at the Laboratory with the exception of two rounds of sampling conducted in 1997 and 1998 at the Los Alamos Water Supply System. Attachment II contains a copy of the letter sent to Mr. Robert Gallegos, NMED Drinking Water and Community Services Bureau, reporting the sampling results. Attachment III contains a copy of the analytical laboratory's reports and a summary table of the sampling and QA/QC results. No perchlorates were detected in any of the samples at concentrations above the analytical laboratory's reporting limit of 4.0 parts per billion (ppb).

As I believe you are aware, from December 6-17, 1999, Mr. Richard Mayer from the U.S. Environmental Protection Agency's (EPA) Resource Conservation and Recovery Act (RCRA) section conducted environmental sampling at the Laboratory. Attachment IV contains a copy of the sampling schedule and sampling plan for this effort. Please note that perchlorate was a specified analyte at the following sampling locations: Upper and Middle Pajarito Canyon springs and surface water sites; Mortandad Canyon alluvial and regional aquifer ground water wells; TA-3 Building 30; and the water production wells PM-2, PM-5, O-4, and PM-1. The Laboratory will forward to your agency all split sample analytical results from this sampling effort as soon as they become available.



5603

After reviewing past and present activities, the Laboratory has identified the following two areas that contain potential perchlorate-related sites: the High-Explosives (HE) Corridor, and Mortandad Canyon. Completed Perchlorate Survey forms, as provided by your agency, for these two areas are contained in Attachment V. Also contained in Attachment V are Tables 1.0, 2.0, 3.0, and a map which provide supplemental information related to these areas.

The HE Corridor has long been used for HE research and development (R&D). Some of the R&D activities conducted at this site are the following: HE development, processing, and machining; open burning and open detonation of HE (firing sites); and rocket sled testing. The majority of the HE R&D activities conducted within the HE Corridor have used HE formulations that do not contain perchlorate or any chlorine compounds. However, five types of sites have been identified where perchlorate-containing compounds have potentially been used or disposed of (see Attachment V, Table 1.0):

- Firing sites at TA-11, 14, 15, 33, 39, 40, and 49 have tested HE formulated with perchlorate-containing compounds;
- HE R&D activities at TA-9 have developed and processed HE with perchlorate-containing compounds. The NPDES outfalls associated with these R&D activities are considered potential perchlorate-related sites because wastewater discharges may have contained trace amounts of perchlorate;
- NPDES outfalls at TA-16 are considered potential perchlorate-related sites because wastewater discharges may have contained trace amounts of perchlorate;
- Rocket sled testing at TA-36 has used perchlorate-containing compounds; and
- Disposal sites MDA-Q at TA-8 and MDA-P at TA-16 received wastes associated with the open burning and open detonation (OB/OD) of HE. Wastes from HE R&D that were formulated with perchlorate-containing compounds may have been disposed of at these sites.

Wastewater has been generated at selected areas within the HE Corridor since the days of the Manhattan Project. Water has historically been used in the machining of HE, because HE mixed with water is relatively safe. In the early 1990's the Laboratory was issued an Administrative Order by the EPA to treat all wastewater generated at HE-processing facilities. Attachment VI contains a brochure published by the Laboratory that details the development of the new High-Explosives Wastewater Treatment Facility (HEWTF). The HEWTF became fully operational in October 1997, as required by the EPA's Administrative Order.

The second area selected as a potential perchlorate-related site is Mortandad Canyon below the Laboratory's NPDES Permitted Outfall 051, the point of discharge for effluent from the TA-50 Radioactive Liquid Wastewater Treatment Facility (RLWTF). The RLWTF treats and discharges aqueous low-level radioactive waste from technical areas within the Laboratory. A query of the Laboratory's Automated Chemical Inventory System (ACIS), a database used to track chemicals

from "cradle-to-grave", shows that a number of perchlorate-containing compounds are used at buildings connected to the RLWTF. Based upon this information, the Laboratory selected Mortandad Canyon as a perchlorate-related area.

Please contact me at 665-1859, or Bob Beers of my staff at 667-7969, should you have questions regarding this matter.

Sincerely,


for Steven Rae
Group Leader
Water Quality and Hydrology Group

RB/rm

Enclosures: a/s

Cy: D. Erickson, ESH-DO, w/enc., MS K491
M. Valdez, ESH-DO, w/enc., MS K491
J. Canepa, E-ER, w/enc., MS M992
T. George, E-ER, w/enc., MS M992
D. Hickmott, EES-1, w/enc., MS D462
T. Taylor, DOE/LAAO, w/enc., MS A316
J. Vozella, DOE/LAAO, w/enc., MS A316
B. Enz, DOE/LAAO, w/enc., MS A316
T. Gunderson, DLD-OPS, w/enc., MS A100
A. Sherrard, ESH-3, w/enc., MS C924
F. Sisneros, ESH-7, w/enc., MS K999
S. Rae, ESH-18, w/enc., MS K497
M. Saladen, ESH-18, w/enc., MS K497
S. Veenis, ESH-18, w/enc., MS K497
D. Rogers, ESH-18, w/enc., MS K497
J. White, ESH-19, w/enc., MS K490
D. Woitte, LC-GL, w/enc., MS A187
WQ&H File, w/enc., MS K497
CIC-10, w/enc., MS A150

ATTACHMENT I

**Letter from NMED-HRMB to
Los Alamos National Laboratory**

September 29, 1999

SUBJECT: Survey of Perchlorate-Related Sites in New Mexico



GARY E. JOHNSON
GOVERNOR

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous and Radioactive Materials Bureau
Harold Runnels Building
2044 A Galisteo, P.O. Box 26110
Santa Fe, New Mexico 87502-6110
Telephone (505) 827-1567
Fax (505) 827-1544



PETER MAGGIORE
SECRETARY

September 29, 1999

To: Fort Bliss, Fort Wingate, Melrose Bombing Range,
Cannon Air Force Base, White Sands Missile Range,
Technologies to Products, Kirtland Air Force Base,
Sandia National Laboratories, Holloman Air Force Base,
Los Alamos National Laboratories (see Distribution List below)

Subject: Survey of Perchlorate-Related Sites in New Mexico

The Hazardous and Radioactive Materials Bureau (HRMB) has received a grant from EPA Region VI to conduct a survey of perchlorate occurrence in New Mexico at RCRA regulated facilities. We will be collecting soil, groundwater, and surface water samples at approximately 10 sites in New Mexico. We request your assistance in helping us select the specific sites that will be sampled. In addition, we request your assistance with identification of any and all perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

EPA is working with the states to identify the occurrence of perchlorate in the environment. Part of this effort is focused on identifying the type of activities that result in perchlorate contamination. EPA is concerned about perchlorate because of its high toxicity, mobility, persistence and because it may be widespread in the environment. Perchlorate contamination is expected to be present at many DOD and DOE sites because it is used as an ingredient in rocket fuel, explosives, and pyrotechnics. Perchlorate contamination is most commonly associated with rocket maintenance activities, such as removal and repacking of solid rocket fuel. However, perchlorate contamination of groundwater has been found to be associated with the management of liquid rocket fuel and open burning/open detonation (OB/OD) of explosives.

Please identify four sites associated with your facility that have the most potential to have perchlorate contamination and complete the attached survey for each site. Please use the criteria on the attached instruction sheet when selecting the four sites. We would appreciate the completed forms be faxed to our office by October 31, 1999. The fax number is (505) 827-1544.

In addition, please complete and submit the attached survey for all perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property. We would appreciate these completed forms be sent to our office by December 31, 1999. Thank you very much for your assistance in this matter. If you have any questions, please contact me at (505) 827-1561, ext. 1023.

Sincerely,


Julie Wanslow

Distribution:

Keith Landreth
Director of Environment
Building 624
Fort Bliss, TX 79916

Commander
Tooele Army Depot
Tooele, Utah 84074

Tom Turner
Chief, Environmental Office
Tooele Army Depot
Tooele, Utah 84074

Loyd S. Utterback, Colonel, USAF
Commander
100 S DL Ingram, Suite 100
Cannon Air Force Base, NM 88103-5214

Denny Barnett
27 CE/CEV
506 N. DL Ingram Blvd.
Cannon Air Force Base, NM 88103

Thomas A. Ladd, Director of National Range
Environment and Safety Directorate
U.S. Army
STEWS-NR-ES
White Sands Missile Range, NM 88002

Robert Myers, Geologist
U.S. Army
STEWS-NR-ES-ES
White Sands Missile Range, NM 88002

Mr. Joseph Fries, Manager
National Aeronautics and Space
Administration (NASA)
Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

Chris DeWitt, Director, Environmental
Management Division
377 ABW/EMR
2050 Wyoming Blvd SE, Room 123
Kirtland Air Force Base, NM 87117-5270

Jerry Sillerud
377 ABW/EMR
2050 Wyoming Blvd SE, Room 126
Kirtland Air Force Base, NM 87117-5270

Warren Cox
Sandia National Laboratories
P.O. Box 5800
Albuquerque, NM 87185-1147

Dr. John Browne, Director
Los Alamos National Laboratory
P.O. Box 1663, MS A100
Los Alamos, NM 87545

Dennis J. Erickson, Director
Los Alamos National Laboratory
ES&H Division, MS K491
Los Alamos, NM 87545

Theodore Taylor, Project Manager
Los Alamos Area Office
Department of Energy
528 35th St., MS A316
Los Alamos, NM 87544

Julie Canepa, Project Manager
Los Alamos National Laboratory
LANL ER Project
MS M992
Los Alamos, NM 87545

Survey of Perchlorate-Related Sites in New Mexico
September 29, 1999
Page 4

**Paul Bryan, Vice President, Energetic
Materials Division
Technologies to Products, Inc. (TPL)
3921 Academy Pkwy North NE
Albuquerque, NM 87109-4416**

**Mark Lillie, Plant Manager @ Fort Wingate
Technologies to Products, Inc. (TPL)
3921 Academy Pkwy North NE
Albuquerque, NM 87109-4416**

**Court Fesmire, IRP Program Manager
550 Tabosa Avenue
Holloman Air Force Base, NM 88330**

**John Poland
550 Tabosa Avenue
Holloman Air Force Base, NM 88330**

ATTACHMENT

Instructions for Completing the Perchlorate Survey

By October 31, 1999, complete the entire survey (Questions 1-18) for four perchlorate-related sites at your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

By December 31, 1999, complete the top portion (Questions 1-8) for all the rest of the perchlorate-related sites at your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

Criteria for Selecting the Four Sites:

1. Select sites where there is a high potential for perchlorate to have contaminated the groundwater or surface water.
2. Select sites that are located near groundwater monitor wells or surface water (if possible).
3. Select up to four different types of perchlorate-related sites (if possible).

Types of Perchlorate-Related Sites: Perchlorate-related sites include sites where explosive items, ammunition, ordnances, solid or liquid rocket fuel, and rocket/missiles underwent certain activities including manufacturing, maintenance, storage, distribution, testing, high-pressure wash out, launching, thermal destruction, open burning, open detonation, or land disposal.

Examples of different types of perchlorate-related sites include:

- open burn and open detonation (OB/OD) sites that were used for outdoor testing or destruction of explosive items (e.g., ammunition, ordnances), solid or liquid rocket fuel, and rockets/missiles,
- waste piles or disposal trenches associated with OB/OD sites,
- sites used for the incineration or thermal destruction of explosive items in enclosed or partially enclosed devices (e.g., incinerators, popper furnaces)
- sites used for manufacturing of explosive items (e.g., ammunition, ordnances),
- sites used for storage or distribution of explosive items (e.g., ammunition, ordnances),
- sites used for maintenance of explosive items (e.g., ammunition, ordnances),

- **sites used for storage of spent or unspent rockets, missiles, or solid or liquid rocket fuel,**
- **sites used for manufacturing of rockets, missiles, or solid or liquid rocket fuel,**
- **sites used for maintenance or refueling of rockets, missiles (e.g., high pressure wash out of rocket fuel, repacking of solid or liquid rocket fuel),**
- **sites used for launching of rockets or missiles containing solid or liquid fuel,**
- **sites used for testing of propellants, rockets, or missiles containing solid or liquid fuel (e.g., sled testing),**

Facility Name: _____
Facility Contact Person: _____
Phone Number: _____
Date: _____
Page ___ of ___

September, 1999

Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: _____
2. Type of perchlorate-related site (see instructions for definition): _____

3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:

4. Has groundwater ever been sampled for perchlorate? YES NO
If yes, indicate dates of sampling and maximum concentrations*: _____
5. Has surface water ever been sampled for perchlorate? YES NO
If yes, indicate dates of sampling and maximum concentrations*: _____
6. Has soil or sediment ever been sampled for perchlorate? YES NO
If yes, indicate dates of sampling and maximum concentrations*: _____
7. Do you suspect this site to have perchlorate contamination? YES NO
If yes, specify which media is suspected as being contaminated? _____
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet): _____
10. Specify dates for the next four scheduled GW sampling events: _____

11. Depth to shallowest monitored zone (in feet): _____
12. Range of Total Dissolved Solids (TDS) in GW: _____
13. Horizontal Distance to Surface Water (in feet): _____
14. Range of TDS of Surface Water: _____
15. Specify dates for the next four scheduled surface water sampling events: _____

16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB? YES NO
17. Could the facility provide GPS information and a map of the sample locations? YES NO
18. Site Access Problems (describe): _____

* If concentrations were below detection, indicate the detection limit.

ATTACHMENT II

**Letter from Los Alamos National Laboratory to
NMED-Drinking Water and Community Services Bureau**

March 18, 1998

**SUBJECT: Operational Monitoring of the Los Alamos Water
System for Perchlorate Contamination**

Los Alamos

NATIONAL LABORATORY

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Date: March 18, 1998
In Reply Refer To: ESH-18/WQ&H:98-0097
Mail Stop: K497
Telephone: (505) 667-7969

Mr. Robert Gallegos
Bureau Chief
Drinking Water and Community Services Bureau
New Mexico Environment Department
525 Camino de los Marquez, Suite 4
Santa Fe, New Mexico 87501

**SUBJECT: OPERATIONAL MONITORING OF THE LOS ALAMOS WATER SYSTEM
FOR PERCHLORATE CONTAMINATION**

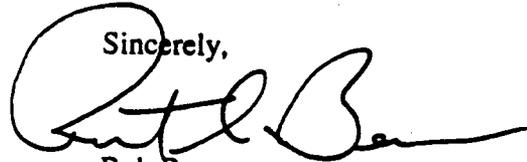
Dear Mr. Gallegos:

Enclosed for your information are the analytical results from operational monitoring of the Los Alamos Water System for perchlorate contamination. The results show that perchlorate is not present at concentrations greater than the laboratory's reporting limit of 4.0 parts per billion (ppb). The California Department of Health Services has adopted a provisional action level of 18 ppb for perchlorate in drinking water.

While perchlorate is not a contaminant regulated by the Safe Drinking Water Act (SDWA) or the New Mexico Drinking Water Regulations, the California Department of Health Services has recently identified perchlorate as a contaminant of concern for drinking water systems located near aerospace, munitions, and fireworks facilities. Monitoring of the Los Alamos Water System was initiated as a Best Management Practice due to Los Alamos National Laboratory's historical use of perchlorate, or precursors to perchlorate.

Please call me at 667-7969 if you have questions or concerns regarding this matter.

Sincerely,



Bob Beers
Water Quality and Hydrology Group

Mr. Robert Gallegos
ESH-18/WQ&H:98-0097

- 2 -

March 18, 1998

RB/em

Enclosures: a/s

Cy: J. Bearzi, NMED District II Field Office, Santa Fe, New Mexico, w/enc.
T. Glasco, Los Alamos County Utilities, Los Alamos, New Mexico, w/enc.
D. Erickson, ESH-DD, w/enc., MS K491
J. Vozella, DOE/LAAO, w/enc., MS A316
B. Koch, DOE/LAAO, w/enc., MS A316
R. Yetter, FSS-8, w/enc., MS K718
S. Rae, ESH-18, w/enc., MS K497
N. Williams, ESH-18, w/enc., MS K497
WQ&H File, w/enc., MS K497
CIC-10, w/enc., MS A150

**Los Alamos Water System
Operational Monitoring for
Perchlorate Contamination**

Sample Location*	Sample ID No.	Sample Date	Sample Results (µg/L)	Reporting Limit (µg/L)
Pajarito Mesa Well #3 (PM-3)	WS 10	12/17/97	ND†	4
Pajarito Mesa Well #3 (PM-3)	WS 11	12/17/97	ND	4
Pajarito Mesa Well #1 (PM-1)	WS 12	12/17/97	ND	4
Pajarito Mesa Well #1 (PM-1)	WS 13	12/17/97	ND	4
Otowi Booster #2	WS 14	12/17/97	ND	4
Otowi Booster #2	WS 15	12/17/97	ND	4
Guaje Booster #2	WS 16	12/17/97	ND	4
Guaje Booster #2	WS 17	12/17/97	ND	4
Pajarito Booster #2	WS 18	12/17/97	ND	4
Pajarito Booster #2	WS 19	12/17/97	ND	4
Pajarito Mesa Well #3 (PM-3)	WS 21	2/26/98	ND	4
Pajarito Mesa Well #3 (PM-3)	WS 22	2/26/98	ND	4
Pajarito Mesa Well #1 (PM-1)	WS 23	2/26/98	ND	4
Pajarito Mesa Well #1 (PM-1)	WS 24	2/26/98	ND	4
Guaje Booster #2	WS 25	2/26/98	ND	4
Guaje Booster #2	WS 26	2/26/98	ND	4
Otowi Booster #2	WS 27	2/26/98	ND	4
Otowi Booster #2	WS 28	2/26/98	ND	4
Pajarito Booster #2	WS 29	2/26/98	ND	4
Pajarito Booster #2	WS 30	2/26/98	ND	4

* Sample locations are entry points to the distribution system.

† None detected at RL (Reporting Limit).

Notes:

(1) Analytical method: EPA Method 300

(2) Analytical services were provided by:

*E.S. Babcock & Sons, Inc.
6100 Quail Valley Court
Riverside, CA 92507*

(3) Sample collection by:

Bob Beers
NMED Certification No. WS 0317

ATTACHMENT IV

Tentative Sampling Schedule

and

LANL Sampling Locations and Analyses

**SUBJECT: December 1999, Environmental Sampling by
U.S. Environmental Protection Agency (EPA)**

TENTATIVE SAMPLING SCHEDULE

Los Alamos National Laboratory
December 6 - 17, 1999

Tentative Date	Location
December 6	EPA/TechLaw personnel receive necessary badges (am) Collect 10 sediment samples in the Los Alamos County Park Area (proximity of the TA-45 tributary to the Acid and Pueblo Canyon confluence)
December 7 - 9	Jim Housley takes GET Test (am) Collect samples from the Mortandad Canyon Wells and coordinate with TA-50 for the collection of effluent from Gaging Station 1
December 10	Collect samples from the Upper and Middle Pajarito Canyon (seven springs and four surface water)
December 13 - 16	Collect 10 sediment samples from Bayo Canyon Collect 10 sediment samples from Sandia Canyon Collect 5 sediment samples from Mortandad Canyon Collect 5 sediment samples from Canada de Buey Collect 5 sediment samples from Pajarito Canyon Collect 5 sediment samples from Ancho Canyon
December 17	Sample the production wells (3:30 am) Samples monitoring well 03-MW-1 at TA-3, Building SM-30

11/22/99

LANL SAMPLING LOCATIONS AND ANALYSES PHASE 2

Sequence	Location	Analyses
1	Los Alamos County Park Area: 10 sediment samples located in the proximity of the TA-45 tributary to the Acid and Pueblo Canyon confluence (county land)	PCBs Total Metals Total Uranium Strontium-90 Isotopic Plutonium Gamma Spec
2	Upper and Middle Pajarito Canyon: Springs (7): Homestead Charlie's Starmer Bulldog Kieling TA-18 Threemile (B) Surface Water (4): BU-0.01 PA-8.9 PA-6.7 TM-0.4 (LANL facility)	Cations (dissolved) Anions Nitrate/Nitrite as Nitrogen Total Phosphorous Ammonia Total Kjedahl Nitrogen Explosives Perchlorate
3	Mortandad Canyon Alluvial Wells: MCO-2 MCO-3 MCO-4B MCO-6 MCO-7 MCWB-7.7B MT-4 TW-8 Gaging Station 1 (LANL facility)	Cations (dissolved) Anions Nitrate/Nitrite as Nitrogen Total Phosphorous Ammonia Total Kjedahl Nitrogen Total Metals Perchlorate Strontium-90 Tritium (low-level) Stable Nitrogen Isotopes
4	Bayo Canyon: 10 sediment samples located in the land transfer area (county land)	PCBs Total Metals Total Uranium Strontium-90 Isotopic Plutonium Isotopic Uranium Gamma Spec Gross Alpha/Beta
5	Sandia Canyon: 10 sediment samples. The exact location is dependent on access to the San Ildefonso Pueblo	PCBs Total Metals Total Uranium Isotopic Uranium Gross Alpha/Beta

Sequence	Location	Analyses
6	Mortandad Canyon: 5 sediment samples. The exact location is dependent on access to the San Ildefonso Pueblo	PCBs Total Metals Total Uranium Strontium-90 Isotopic Plutonium Isotopic Uranium Gamma Spec Gross Alpha/Beta
7	Canada de Buey Canyon: 5 sediment samples located in a residential area in the White Rock community (county land)	PCBs Total Metals Total Uranium Strontium-90 Isotopic Plutonium Isotopic Uranium Gamma Spec Gross Alpha/Beta
8	Pajarito Canyon: 5 sediment samples located in a residential area in the White Rock community (county land)	PCBs Total Metals Total Uranium Strontium-90 Isotopic Plutonium Isotopic Uranium Gamma Spec Gross Alpha/Beta
9	TA-3, Building SM-30: 1 groundwater sample collected from monitoring well 03-MW-1 and 1 surface water sample collected at a seep near the same location (LANL facility)	Volatile Organic Compounds Cations (dissolved) Anions Perchlorate Tritium (low-level)
10	Production Wells (A): Water supply wells PM-2 PM-5 Production Wells (B): Water supply wells O-4 PM-1	Volatile Organic Compounds Total Barium Perchlorate Explosives Nitrate/Nitrite as Nitrogen Total Phosphorous Ammonia Total Kjedahl Nitrogen Total Arsenic Total Uranium Perchlorate Strontium-90
11	Ancho Canyon: 5 sediment samples located on DOE land with public access for recreational use	PCBs Total Metals Total Uranium Strontium-90 Isotopic Plutonium Isotopic Uranium

Sequence:	Location:	Analyses:
		Gamma Spec Gross Alpha/Beta

Total Metals include:

antimony
arsenic
barium
beryllium
cadmium
chromium
cobalt
copper
lead
mercury
nickel
selenium
silver
thallium
vanadium
zinc

Cations include:

aluminum
calcium
iron
magnesium
manganese
potassium
sodium
silicon
strontium

Anions include:

carbonate
hydrogen carbonate
chlorine
fluorine
sulfate

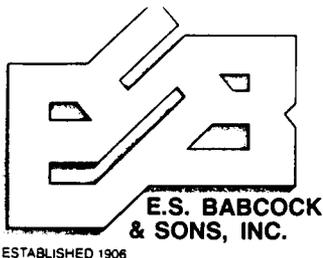
ATTACHMENT III

**E.S. Babcock & Sons, Inc. Analytical Reports
January 7, 1998
March 10, 1999**

and

**ESH-18 Perchlorate Monitoring Summary Table
March 17, 1998**

**SUBJECT: Operational Monitoring of the Los Alamos Water
System for Perchlorate Contamination**



6100 Quail Valley Court Riverside, CA 92507
P.O. Box 432 Riverside, CA 92502
PH (909) 653-3351 FAX (909) 653-1662
Environmental Laboratory Certification #1156

2951-PERC

Client:

Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos, NM 87545

Client I.D.: water as listed

Page: 1 of 2
Lab No.: L36569-001 to 015

Date Reported: 01/07/98

Submitted By: FedEx
Date: 12/19/97
Time: 0945

Identification	Collected Date Time	DHS-IC-Rev0 Perchlorate ug/L		
-001 WS01	9712170800	15.	-	-
	RL:	4.	-	-
-002 WS03	9712170800	15.	-	-
	RL:	4.	-	-
-003 WS05	9712170800	7.	-	-
	RL:	4.	-	-
-004 WS06	9712170800	8.	-	-
	RL:	4.	-	-
WS10	9712170810	ND	-	-
	RL:	4.	-	-
-006 WS11	9712170815	ND	-	-
	RL:	4.	-	-
-007 WS12	9712170825	ND	-	-
	RL:	4.	-	-
-008 WS13	9712170830	ND	-	-
	RL:	4.	-	-
-009 WS14	9712170840	ND	-	-
	RL:	4.	-	-
-010 WS15	9712170845	ND	-	-
	RL:	4.	-	-
-011 WS16	9712170920	ND	-	-
	RL:	4.	-	-

Date analysis completed: (Perchlorate:01/05/98)
ND = None detected at RL (Reporting Limit).

cc:



ESTABLISHED 1906

2951-PERC
Client:

Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos, NM 87545

Client I.D.: water as listed

6100 Quail Valley Court Riverside, CA 92507
P.O. Box 432 Riverside, CA 92502
PH (909) 653-3351 FAX (909) 653-1662
Environmental Laboratory Certification #1156

Page: 2 of 2
Lab No.: L36569-001 to 015

Date Reported: 01/07/98

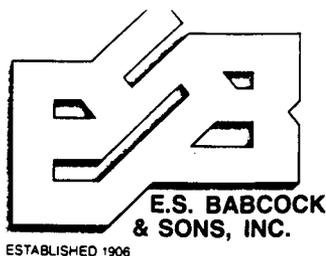
Submitted By: FedEx
Date: 12/19/97
Time: 0945

Identification	Collected Date Time	DHS-IC-Rev0 Perchlorate ug/L		
-012 WS17	9712170925	ND	-	-
	RL:	4.	-	-
-013 WS18	9712170950	ND	-	-
	RL:	4.	-	-
-014 WS19	9712170955	ND	-	-
	RL:	4.	-	-
-015 WS20	9712171500	ND	-	-
	RL:	4.	-	-

Date analysis completed: (Perchlorate:01/05/98)
ND = None detected at RL (Reporting Limit).

cc:

E. S. Babcock & Sons Inc.
Allison M. [Signature]



6100 Quail Valley Court Riverside, CA 92507
 P.O. Box 432 Riverside, CA 92502
 PH (909) 653-3351 FAX (909) 653-1662
 Environmental Laboratory Certification #1156

Wet Chemistry - Batch QC

Log #: L36569
 For Client: Los Alamos National Laboratory
 Date Rec'd: 12/19/1997
 Lab Number: L36569-001 to -015

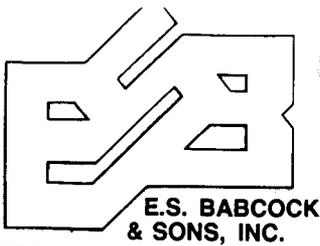
Analyte: Perchlorate

WG25665

Reference	Ref Value	Units	QC Type	Result	Units	RPD	%Rec	Batch Date	LCL	UCL
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980105SF	< RL	
Spike Value	20.0	ug/L	LCS	20.0	ug/L	---	100.	980105SF	70% - 130%	
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980105SF	< RL	
Spike Value	20.0	ug/L	LCS	18.7	ug/L	---	93.5	980105SF	70% - 130%	
L36569-010	0.0	ug/L	DUP	0.0	ug/L	N/A	---	980105SF	Max 20 RPD (b)	
Spike Value	18.0	ug/L	MS	18.2	ug/L	---	101.	980105SF		(a)
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980105SF	< RL	
Spike Value	20.0	ug/L	LCS	16.6	ug/L	---	83.0	980105SF	70% - 130%	
L36611-001	3.2	ug/L	DUP	3.4	ug/L	6.1	---	980105SF	Max 20 RPD (b)	
Spike Value	18.0	ug/L	MS	21.1	ug/L	---	99.4	980105SF		(a)
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980105SF	< RL	
Spike Value	20.0	ug/L	LCS	17.5	ug/L	---	87.5	980105SF	70% - 130%	
L36754-004	0.0	ug/L	DUP	0.0	ug/L	N/A	---	980105SF	Max 20 RPD (b)	
Spike Value	18.0	ug/L	MS	15.2	ug/L	---	84.4	980105SF		(a)
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980105SF	< RL	
Spike Value	20.0	ug/L	LCS	18.3	ug/L	---	91.5	980105SF	70% - 130%	
L36754-004	3.6	ug/L	DUP	4.4	ug/L	20.	---	980105SF	Max 20 RPD (b)	
Spike Value	18.0	ug/L	MS	23.3	ug/L	---	109.	980105SF		(a)

- (a) Target range same as LCS Control Limits. If outside range, matrix interference suspected.
 (b) Exceptions: Cyanide and Kjeldahl-Nitrogen : Max 30 RPD
 Oil & Grease, Suspended Solids and Organic analyses: Max 40 RPD

Sean H. Jenkins
 E.S. Babcock & Sons, Inc.



E.S. BABCOCK & SONS, INC.

ESTABLISHED 1906

2951-PERC
Client:

Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos, NM 87545

Client I.D.: water as listed

6100 Quail Valley Court Riverside, CA 92507
P.O. Box 432 Riverside, CA 92502
PH (909) 653-3351 FAX (909) 653-1662
Environmental Laboratory Certification #1156

Page: 1 of 2
Lab No.: L38957-001 to 014

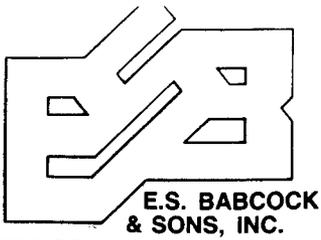
Date Reported: 03/10/98

Submitted By: Fed Ex
Date: 02/28/98
Time: 1000

Identification	Collected Date Time	DHS-IC-Rev0 Perchlorate ug/L		
-001 WS04	9802261530	17.	-	-
	RL:	4.	-	-
-002 WS09	9802261530	22.	-	-
	RL:	4.	-	-
-003 WS21	9802261515	ND	-	-
	RL:	4.	-	-
-004 WS22	9802261515	ND	-	-
	RL:	4.	-	-
WS23	9802261500	ND	-	-
	RL:	4.	-	-
-006 WS24	9802261500	ND	-	-
	RL:	4.	-	-
-007 WS25	9802261150	ND	-	-
	RL:	4.	-	-
-008 WS26	9802261150	ND	-	-
	RL:	4.	-	-
-009 WS27	9802261240	ND	-	-
	RL:	4.	-	-
-010 WS28	9802261240	ND	-	-
	RL:	4.	-	-
-011 WS29	9802261300	ND	-	-
	RL:	4.	-	-

Date analysis completed: (Perchlorate:03/09/98)
ND = None detected at RL (Reporting Limit).

cc:



6100 Quail Valley Court Riverside, CA 92507
P.O. Box 432 Riverside, CA 92502
PH (909) 653-3351 FAX (909) 653-1662
Environmental Laboratory Certification #1156

2951-PERC

Client:

Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos, NM 87545

Client I.D.: water as listed

Page: 2 of 2
Lab No.: L38957-001 to 014

Date Reported: 03/10/98

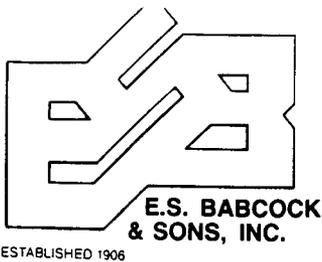
Submitted By: Fed Ex
Date: 02/28/98
Time: 1000

Identification	Collected Date Time	DHS-IC-Rev0 Perchlorate ug/L		
-012 WS30	9802261300	ND	-	-
	RL:	4.	-	-
-013 WS31	9802261545	ND	-	-
	RL:	4.	-	-
-014 WS32	9802261545	ND	-	-
	RL:	4.	-	-

Date analysis completed: (Perchlorate:03/09/98)
ND = None detected at RL (Reporting Limit).

cc:

E. S. Babcock & Sons Inc.



6100 Quail Valley Court Riverside, CA 92507
 P.O. Box 432 Riverside, CA 92502
 PH (909) 653-3351 FAX (909) 653-1662
 Environmental Laboratory Certification #1156

Wet Chemistry - Batch QC

Log #: L38957
 For Client: Los Alamos National Laboratory
 Date Rec'd: 02/28/1998
 Lab Number: L38957-001 to -014

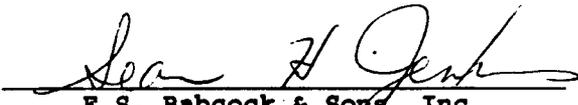
Analyte: Perchlorate **WG27233**

Reference	Ref Value	Units	QC Type	Result	Units	RPD	%Rec	Batch Date	LCL	UCL
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980304SF	< RL	
Spike Value	20.0	ug/L	LCS	22.0	ug/L	---	110.	980304SF	70% - 130%	
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980304SF	< RL	
Spike Value	20.0	ug/L	LCS	20.5	ug/L	---	103.	980304SF	70% - 130%	
L38957-006	0.0	ug/L	DUP	0.0	ug/L	N/A	---	980304SF	Max 20 RPD (b)	
Spike Value	18.0	ug/L	MS	18.8	ug/L	---	104.	980304SF		(a)
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980304SF	< RL	
Spike Value	20.0	ug/L	LCS	21.7	ug/L	---	109.	980304SF	70% - 130%	
L39033-002	2.6	ug/L	DUP	2.4	ug/L	8.0	---	980304SF	Max 20 RPD (b)	
Spike Value	18.0	ug/L	MS	22.1	ug/L	---	108.	980304SF		(a)
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980304SF	< RL	
Spike Value	20.0	ug/L	LCS	19.2	ug/L	---	96.0	980304SF	70% - 130%	

Analyte: Perchlorate **WG27346**

Reference	Ref Value	Units	QC Type	Result	Units	RPD	%Rec	Batch Date	LCL	UCL
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980309SF	< RL	
Spike Value	20.0	ug/L	LCS	19.0	ug/L	---	95.0	980309SF	70% - 130%	
Blank	0.000	ug/L	MB	0.0	ug/L	---	---	980309SF	< RL	
Spike Value	20.0	ug/L	LCS	19.2	ug/L	---	96.0	980309SF	70% - 130%	
L39033-004	0.0	ug/L	DUP	0.0	ug/L	N/A	---	980309SF	Max 20 RPD (b)	
Spike Value	18.0	ug/L	MS	19.3	ug/L	---	107.	980309SF		(a)

(a) Target range same as LCS Control Limits. If outside range, matrix interference suspected.
 Exceptions: Cyanide and Kjeldahl-Nitrogen : Max 30 RPD
 Oil & Grease and Suspended Solids: Max 40 RPD


 E.S. Babcock & Sons, Inc.

Los Alamos Water Supply System
Operational Monitoring for
Perchlorate Ion Contamination

Sample ID No.	Sample Date	Sample Location	Sample Results* ($\mu\text{g/L}$)	Reporting Limit ($\mu\text{g/L}$)
1st Quarter Sampling				
WS 01	12/17/97	QAQC Spike	15. (16.7)	4
WS 03	12/17/97	QAQC Spike	15. (18.8)	4
WS 05	12/17/97	QAQC Spike	7. (8.5)	4
WS 06	12/17/97	QAQC Spike	8. (6.8)	4
WS 10	12/17/97	PM-3	ND	4
WS 11	12/17/97	PM-3	ND	4
WS 12	12/17/97	PM-1	ND	4
WS 13	12/17/97	PM-1	ND	4
WS 14	12/17/97	Otowi Booster #2	ND	4
WS 15	12/17/97	Otowi Booster #2	ND	4
WS 16	12/17/97	Guaje Booster #2	ND	4
WS 17	12/17/97	Guaje Booster #2	ND	4
WS 18	12/17/97	Pajarito Booster #2	ND	4
WS 19	12/17/97	Pajarito Booster #2	ND	4
WS 20	12/17/97	QAQC Blank	ND (0.0)	4
2nd Quarter Sampling				
WS 04	2/26/98	QAQC Spike	17. (15.3)	4
WS 09	2/26/98	QAQC Spike	22. (17.1)	4
WS 21	2/26/98	PM-3	ND	4
WS 22	2/26/98	PM-3	ND	4
WS 23	2/26/98	PM-1	ND	4
WS 24	2/26/98	PM-1	ND	4
WS 25	2/26/98	Guaje Booster #2	ND	4
WS 26	2/26/98	Guaje Booster #2	ND	4
WS 27	2/26/98	Otowi Booster #2	ND	4
WS 28	2/26/98	Otowi Booster #2	ND	4
WS 29	2/26/98	Pajarito Booster #2	ND	4
WS 30	2/26/98	Pajarito Booster #2	ND	4
WS 31	2/26/98	QAQC Blank	ND (0.0)	4
WS 32	2/26/98	QAQC Blank	ND (0.0)	4
* () Expected results				

ATTACHMENT V

**High-Explosives Corridor Site Survey Form
Mortandad Canyon Site Survey Form**

and

**Table 1.0 High-Explosives Corridor Site
Table 2.0 Mortandad Canyon Site
Table 3.0 NMED/HRMB Defined Source Types**

and

Perchlorate-Related Sites Survey Map

Facility Name: Los Alamos National Laboratory

Facility Contact Person: Bob Beers

Phone Number: 667-7969

Date: December 23, 1999

Page 1 of 2

Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA – or HSWA – regulated sites and sites that are not located on your property.

1. Site Name: High-Explosives (HE) Corridor
2. Type of perchlorate-related site (see instructions for definitions): See Table 1.0.
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed: See Table 1.0. Volume estimates are not available.
4. Has groundwater ever been sampled for perchlorate? YES NO
If yes, indicate dates of sampling and maximum concentrations: On December 13, 1999, EPA and LANL split samples from the following water production wells for perchlorate analysis: PM-5, PM-2. Results were not available at the time this report was prepared. In addition, Attachments II and III present the results from LANL sampling of the drinking water system for perchlorate in 1997-98.
5. Has surface water ever been sampled for perchlorate? YES NO
If yes, indicate dates of sampling and maximum concentrations: On December 10, 1999, EPA collected samples for perchlorate analysis from seven springs and four surface water sources in upper and middle Pajarito Canyon. Results were not available at the time this report was prepared.
6. Has soil or sediment ever been sampled for perchlorate? YES NO
If yes, indicate dates of sampling and maximum concentrations: _____
7. Do you suspect this site to have perchlorate contamination? YES NO UNKNOWN
If yes, specify which media is suspected as being contaminated? _____
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also described proposed analytical method and detection limit): None scheduled.

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet): See attached map.
10. Specify dates for the next for scheduled GW sampling events: None scheduled.
11. Depth to shallowest monitored zone (in feet): Water production well, PM-2: depth to water (non-pumping) is approximately 870 ft (Water Supply at Los Alamos during 1996, LANL LA-13371-PR). Regional aquifer wells, DT-5A, DT-9, and DT-10: depth to water is approximately 1000 ft.-1200 ft. (Geologic and Hydrologic Records at Los Alamos, LANL, LA-12883-MS, 1995).
12. Range of Total Dissolved Solids (TDS) in GW: Water production well, PM-2: 1998 TDS results: 167 mg/L (1998 Environmental Surveillance Report, LANL). Regional aquifer test wells, DT-5A, DT-9, and DT-10: 1998 TDS results are 120 mg/L, 140 mg/L, and 138 mg/L, respectively (1998 Environmental Surveillance Report, LANL).
13. Horizontal Distance to Surface Water: See attached map.
14. Range of TDS of Surface Water: Water Canyon at Beta: 1998 TDS results: 312 mg/L (1998 Environmental Surveillance Report, LANL).
15. Specify dates for the next four scheduled surface water sampling events: None scheduled.
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB? YES NO
17. Could the facility provide GPS information and a map of the sample locations? YES NO
18. Site Access Problems (describe): Escort and badging requirements apply.

*If concentrations were below detection, indicate the detection limit.

Facility Name: Los Alamos National Laboratory
Facility Contact Person: Bob Beers
Phone Number: 667-7969
Date: December 23, 1999
Page 2 of 2

Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA – or HSWA – regulated sites and sites that are not located on your property.

1. Site Name: Mortandad Canyon
2. Type of perchlorate-related site (see instructions for definitions): See Table 2.0.
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed: See Table 2.0. Volume estimates are not available.
4. Has groundwater ever been sampled for perchlorate? **YES NO**
If yes, indicate dates of sampling and maximum concentrations: On December 13, 1999, EPA and LANL split samples from the following water production wells for perchlorate analysis: PM-5, PM-2. Results not available at the time this report was prepared. On December 7-9, 1999, EPA sampled Mortandad Canyon alluvial wells and a regional aquifer test well (TW-8) for perchlorate. Results not available at the time this report was prepared. In addition, Attachments II and III present the results from LANL sampling of the drinking water system for perchlorate in 1997 and 1998.
5. Has surface water ever been sampled for perchlorate? **YES NO**
If yes, indicate dates of sampling and maximum concentrations: On December 7-9, 1999, EPA sampled surface water at station GS-1 in Mortandad Canyon for perchlorate. Results were not available at the time this report was prepared.
6. Has soil or sediment ever been sampled for perchlorate? **YES NO**
If yes, indicate dates of sampling and maximum concentrations: _____
7. Do you suspect this site to have perchlorate contamination? **YES NO UNKNOWN**
If yes, specify which media is suspected as being contaminated? _____
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also described proposed analytical method and detection limit):
None currently planned.

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet): See attached map.
10. Specify dates for the next for scheduled GW sampling events: None scheduled.
11. Depth to shallowest monitored zone (in feet): Variable: approximately 6 ft. at MCO-3 in upper Mortandad Canyon; approximately 42 ft. at MCO-7 in lower Mortandad Canyon.
12. Range of Total Dissolved Solids (TDS) in GW: In Mortandad Canyon alluvial groundwater: 1998 TDS values ranged from 366-962 mg/L (1998 Environmental Surveillance Report, LANL).
13. Horizontal Distance to Surface Water: See attached map.
14. Range of TDS of Surface Water: Mortandad Canyon at GS-1: 1997 TDS result was 298 mg/L (1997 Environmental Surveillance Report, LANL).
15. Specify dates for the next four scheduled surface water sampling events: None scheduled.
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB? **YES NO**
17. Could the facility provide GPS information and a map of the sample locations? **YES NO**
18. Site Access Problems (describe): Escort and badging requirements apply.

*If concentrations were below detection, indicate the detection limit.

**Los Alamos National Laboratory
Perchlorate-Related Sites Survey**

2/22/99

TABLE 1.0 HIGH-EXPLOSIVES (HE) CORRIDOR

Technical Area (TA)	Potential Sources	HRMB Source Types ¹	ER Project Workplan	Watershed(s)	Surface Water Monitoring Sites ²	Springs Monitoring Sites ³	Ground Water Monitoring Sites
TA-8	Disposal area: MDA-Q	2	OU 1157	Pajarito Canyon	3	2	PM-2, R-25
TA-9	HE R&D	4	OU 1157	Pajarito Canyon	3	1	PM-2, R-25
TA-11	Firing sites	1	OU 1082	Water Canyon	1	5	DT-5A, DT-9, DT-10
TA-14	Firing sites	1	OU 1085	Pajarito Canyon Canon de Valle	1, 3	8	PM-2
TA-15	Firing sites	1	OU 1086	Pajarito Canyon Water Canyon	1, 3	5, 8	PM-2
TA-16	NPDES outfalls	4	OU 1082	Canon de Valle Water Canyon	1	3, 5	R-25
TA-16	Disposal area: MDA-P	2	OU 1082	Canon de Valle Water Canyon	1	3, 5	R-25
TA-33	Firing sites	1	OU 1122	Chaquehui & Ancho Canyons	None	6, 7	None
TA-36	Rocket sled testing	11	OU 1130	Portrillo, Pajarito & Water Canyons	3	7, 8	PM-2
TA-39	Firing sites	1	OU 1132	Ancho Canyon Water Canyon	None	6, 7	None
TA-40	Firing sites	1	OU 1111	Pajarito Canyon	3	None	PM-2
TA-49	Firing sites	1		Ancho Canyon Water Canyon	1	6, 7	DT-5A, DT-9, DT-10

¹See Table 3.0 for a list of NMED/HRMB defined source types for perchlorate.

**Los Alamos National Laboratory
Perchlorate-Related Sites Survey**

1/22/99

TABLE 2.0 MORTANDAD CANYON

Technical Area (TA)	Potential Sources	HRMB Source Type¹	ER Project Workplan	Watershed(s)	Surface Water Monitoring Sites²	Springs Monitoring Sites³	Ground Water Monitoring Sites
TA-35	TA-50 RLWTF NPDES Outfall	Other ⁴	OU 1129	Mortandad Canyon	2	None	MCO-3, 4B, 5, 6, 7, & R-15

²Surface Water Monitoring Sites

1. Water Canyon at Beta
2. GS-1
3. Pajarito Canyon

³Springs Monitoring Sites

1. Arroyo del LaDelfe springs
2. Upper Pajarito springs
3. Canon de Valle springs
4. Fishladder springs
5. Water Canyon springs at Beta
6. Lower Ancho Canyon springs
7. Rio Grande springs
8. Three Mile Canyon springs

⁴Other

ACIS database shows widespread use of perchlorate containing compounds at buildings discharging to the RLWTF.

Los Alamos National Laboratory
Perchlorate Survey

1/21/99

TABLE 3.0. NMED/HRMB Defined Source Types for Perchlorate.

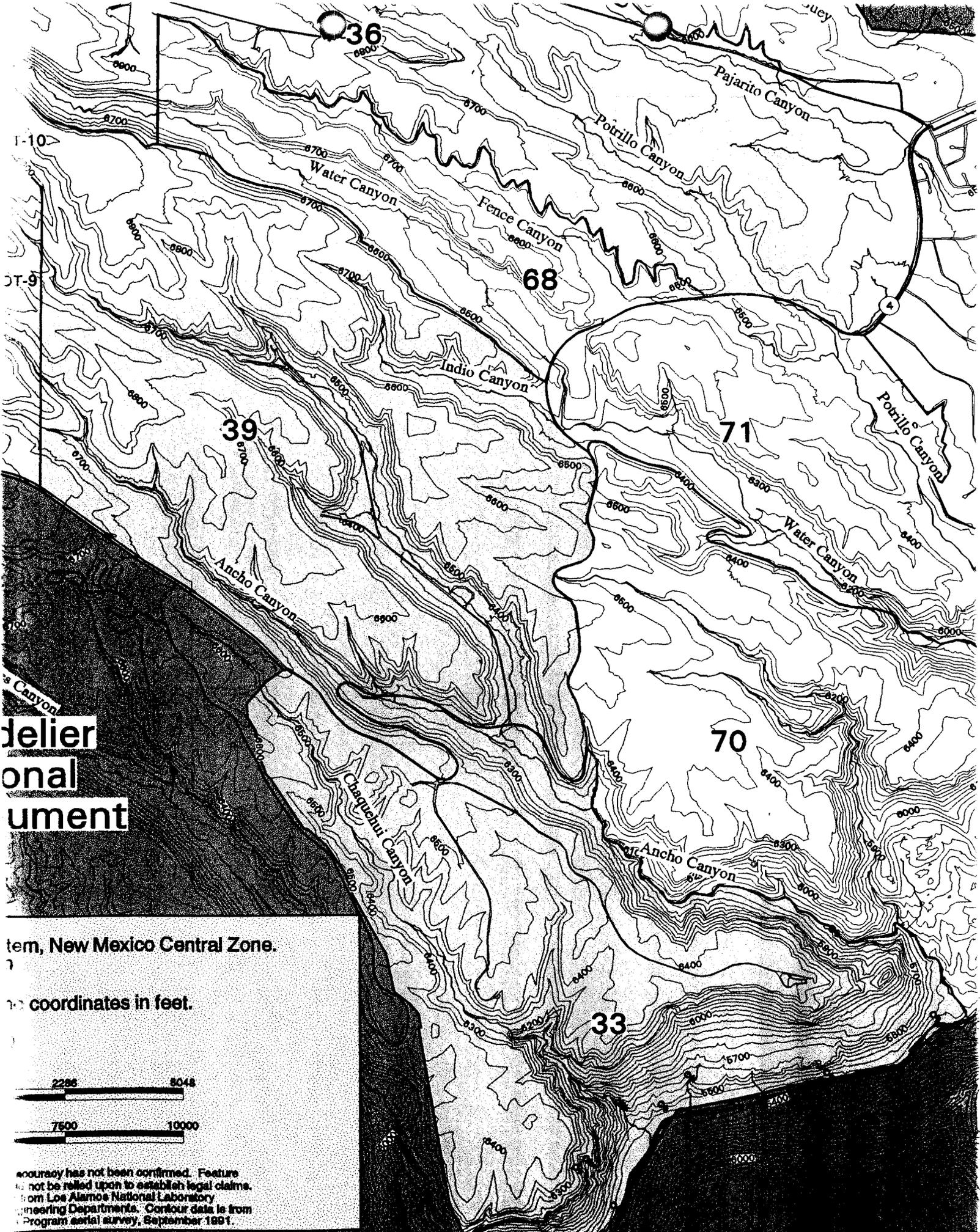
1. Open burn and open detonation (OB/OD) sites used for outdoor testing or destruction of explosive items, solid or liquid rocket fuels, rockets/missles.
2. Waste piles or disposal trenches associated with OB/OD sites.
3. Sites used for incineration or thermal destruction of explosive items in enclosed or partially enclosed devices (incinerators, popper furnaces).
4. Sites used for manufacturing of explosive items.
5. Sites used for storage or distribution of explosive items.
6. Sites used for maintenance of explosive items.
7. Sites used for storage of spent or unspent rockets, missles, or solid or liquid rocket fuel.
8. Sites used for manufacturing of rockets, missles, or solid or liquid rocket fuel.
9. Sites used for maintenance or refueling of rockets, missles, or solid or liquid rocket fuel.
10. Sites used for launching of rockets or missles containing solid or liquid rocket fuel.
11. Sites used for testing of propellants, rockets, or missles containing solid or liquid fueled (eg, sled testing).

ATTACHMENT VI

**LOS ALAMOS NATIONAL LABORATORY
PUBLICATION, LALP 98-84
1998**

***HIGH - EXPLOSIVES WASTEWATER TREATMENT
FACILITY (HEWTF)***

AN ENVIRONMENTAL SUCCESS STORY



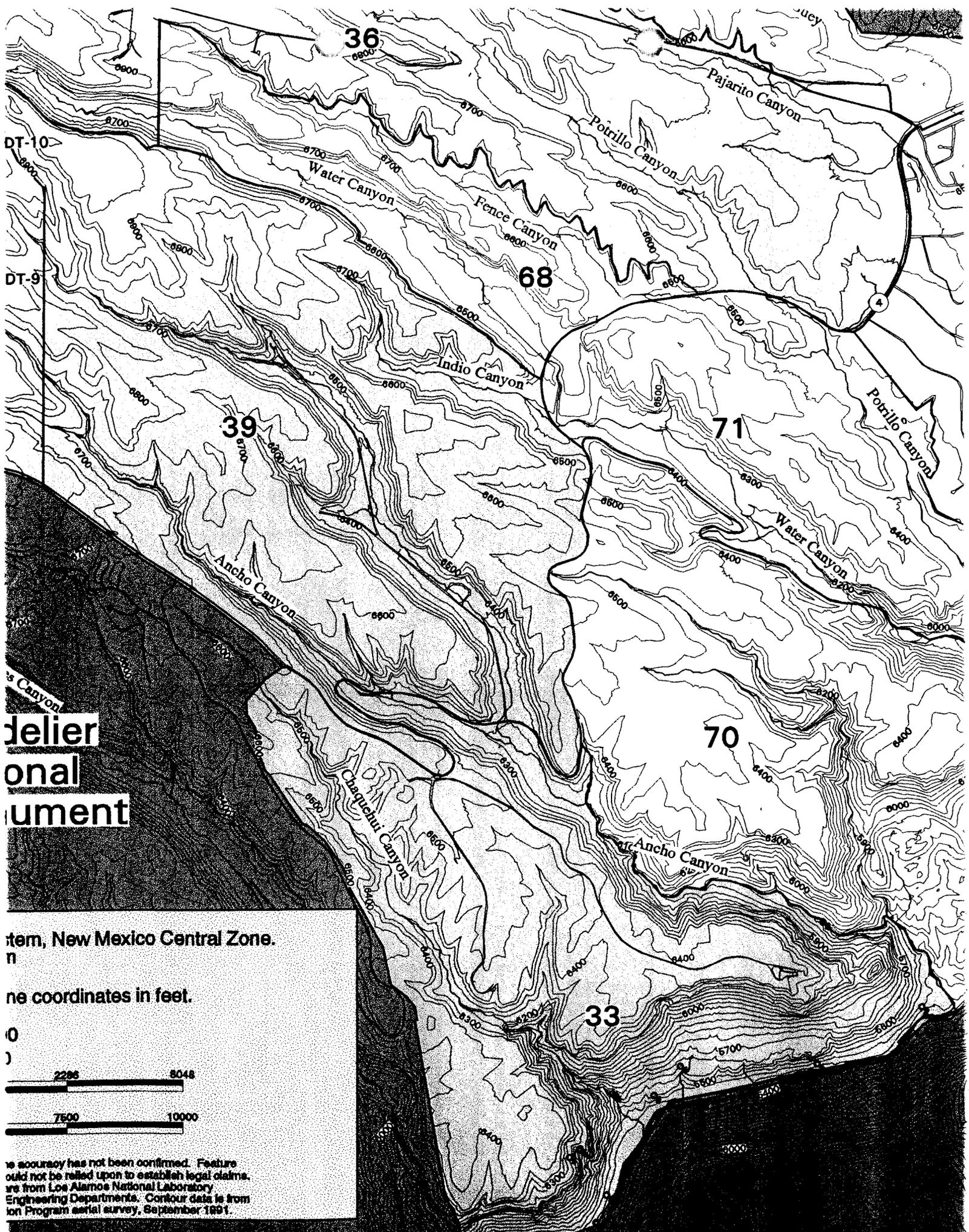
Delier
onal
ument

tem, New Mexico Central Zone.

coordinates in feet.



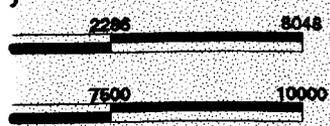
Accuracy has not been confirmed. Feature
 cannot be relied upon to establish legal claims.
 Data from Los Alamos National Laboratory
 Engineering Departments. Contour data from
 Program aerial survey, September 1991.



**Delirion
National
Monument**

item, New Mexico Central Zone.

ne coordinates in feet.



Accuracy has not been confirmed. Feature could not be relied upon to establish legal claims. Data from Los Alamos National Laboratory Engineering Department. Contour data is from ion Program aerial survey, September 1991.

67

San Ildefonso Pueblo

15

51

18

54

PM-2

36

White Rock

49

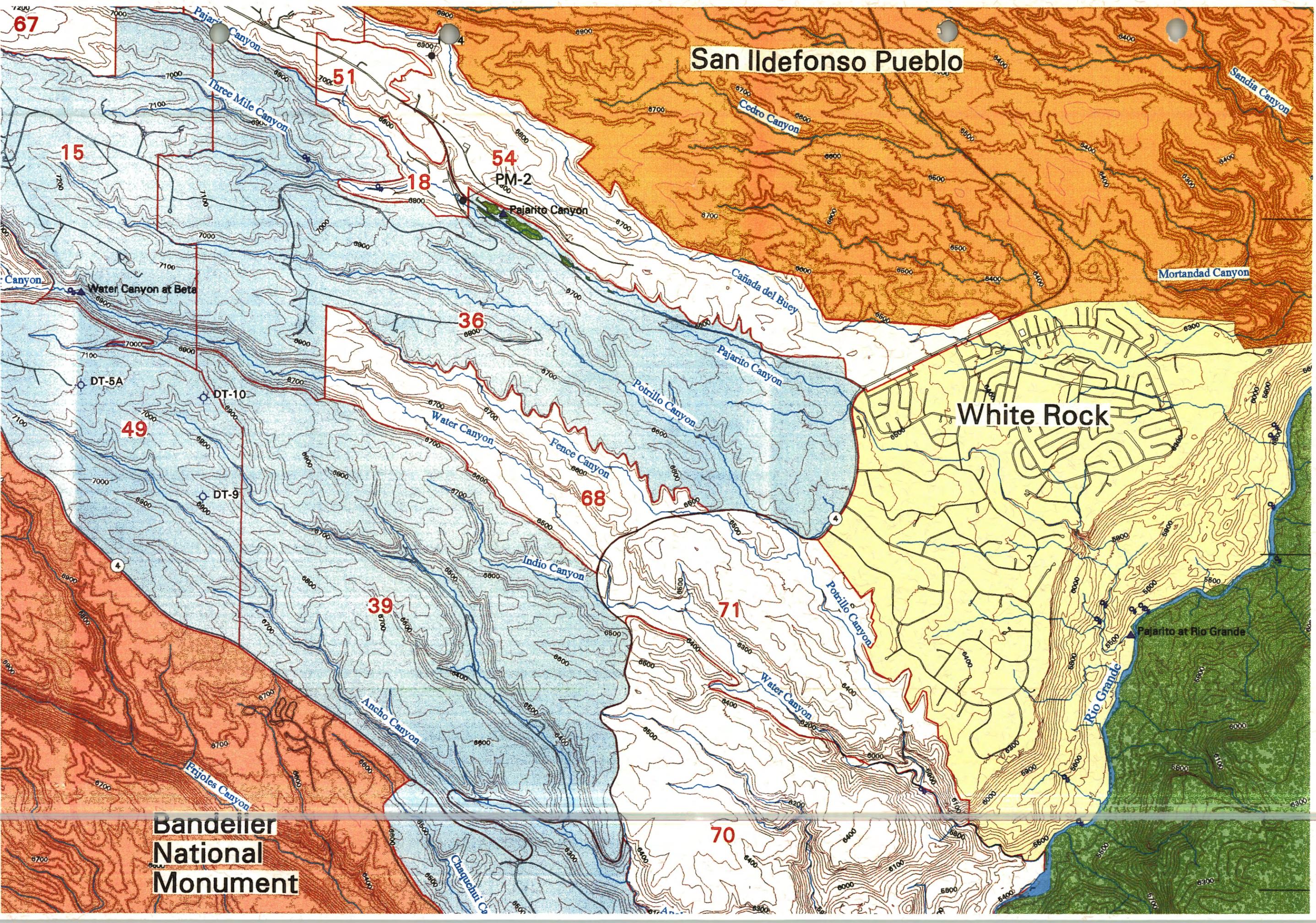
68

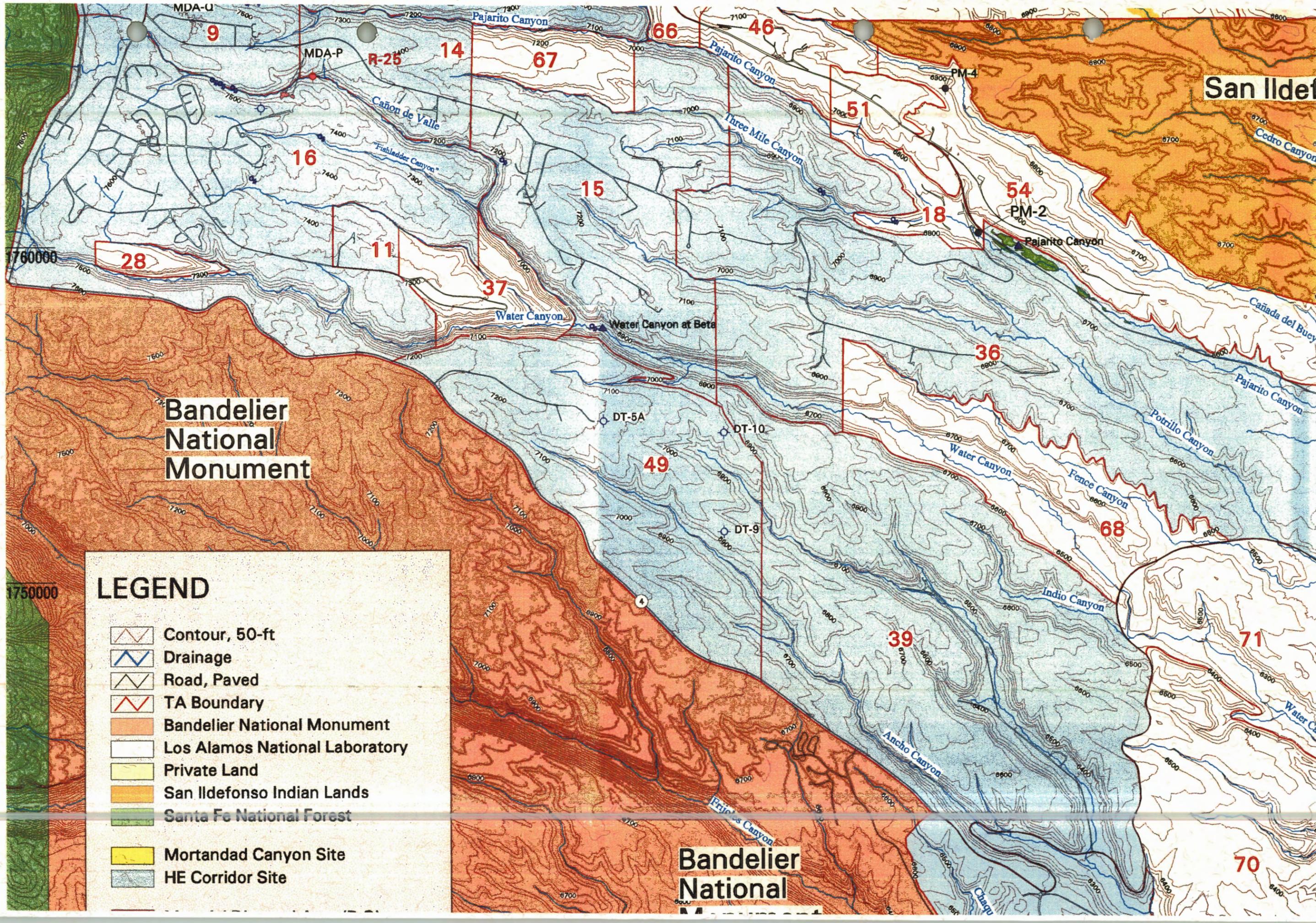
39

71

Bandelier National Monument

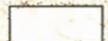
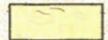
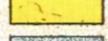
70





**Bandelier
National
Monument**

LEGEND

-  Contour, 50-ft
-  Drainage
-  Road, Paved
-  TA Boundary
-  Bandelier National Monument
-  Los Alamos National Laboratory
-  Private Land
-  San Ildefonso Indian Lands
-  Santa Fe National Forest
-  Mortandad Canyon Site
-  HE Corridor Site

**Bandelier
National**

Monument

LEGEND

-  Contour, 50-ft
-  Drainage
-  Road, Paved
-  TA Boundary
-  Bandelier National Monument
-  Los Alamos National Laboratory
-  Private Land
-  San Ildefonso Indian Lands
-  Santa Fe National Forest
-  Mortandad Canyon Site
-  HE Corridor Site
-  Material Disposal Area (P,Q)
-  Wetland
-  Gaging Station
-  Groundwater Well
-  NPDES Outfall 051 Location (Active)
-  Proposed Regional Well
-  Spring
-  Surface Water Sampling Station
-  Water Supply Well

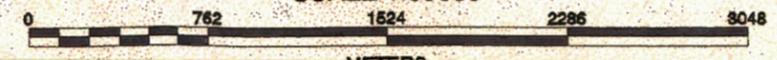
Bandelier National Monument



State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

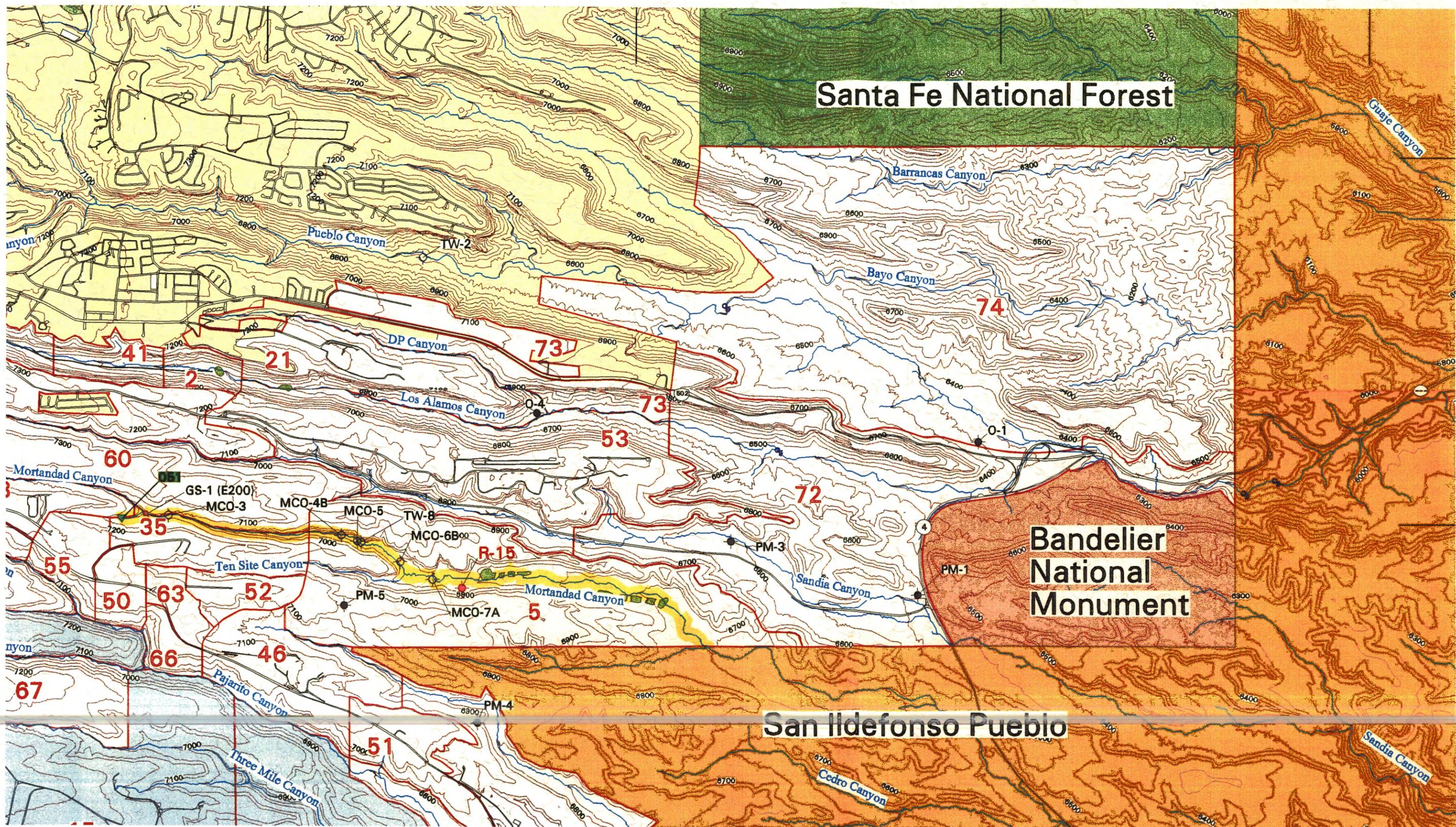
Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 10000
Feet per inch on map = 2500

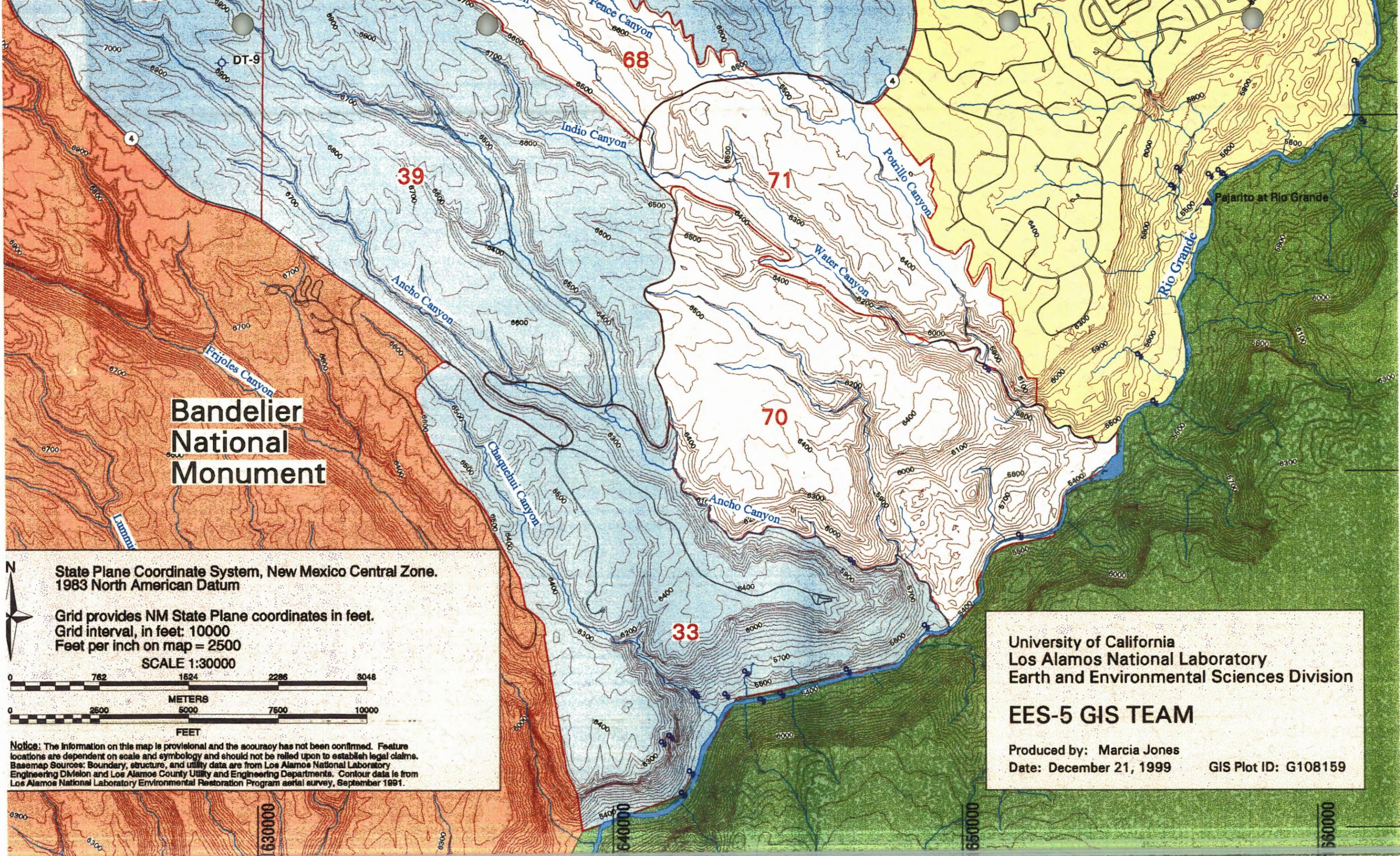
SCALE 1:30000



Notice: The information on this map is provisional and the accuracy has not been confirmed. Feature locations are dependent on scale and symbology and should not be relied upon to establish legal claims. Basemap Sources: Boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data is from Los Alamos National Laboratory Environmental Restoration Program aerial survey, September 1991.

Perchlorate-Related Sites Survey

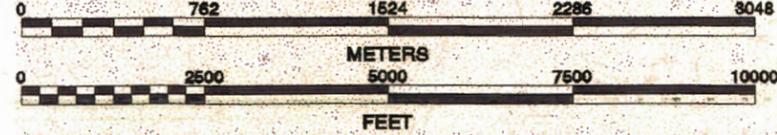




Bandelier National Monument

State Plane Coordinate System, New Mexico Central Zone.
1983 North American Datum

Grid provides NM State Plane coordinates in feet.
Grid interval, in feet: 10000
Feet per inch on map = 2500
SCALE 1:30000



Notice: The information on this map is provisional and the accuracy has not been confirmed. Feature locations are dependent on scale and symbology and should not be relied upon to establish legal claims. Base map Sources: Boundary, structure, and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data is from Los Alamos National Laboratory Environmental Restoration Program aerial survey, September 1991.

University of California
Los Alamos National Laboratory
Earth and Environmental Sciences Division
EES-5 GIS TEAM
Produced by: Marcia Jones
Date: December 21, 1999 GIS Plot ID: G108159

Perchlorate-Related Sites Survey

